

and spinal paralysis which show a tendency to an ascending course have been in fact included in Landry's paralysis, but it is now generally accepted that this term should be restricted to a condition which begins with a progressive paralysis of the lower limbs that rapidly ascends and involves the trunk muscles, later those of the arms, and as a rule leads to a fatal termination from respiratory palsy before the cranial nerves are affected. Objective sensory disturbances are also very slight or absent, and the sphincters are rarely involved.

The clinical symptoms of acute febrile polyneuritis are also sufficiently distinct to permit its differential diagnosis from other forms of peripheral neuritis, though none of the individual symptoms are peculiar to any one of them. The more usual causes of neuritis, namely, alcohol, lead, arsenic, and various organic poisons, as well as the recent occurrence of diphtheria, scarlet fever and of other infectious illnesses, should be in the first place excluded. From alcoholic neuritis it is distinguished by the relative uniformity of the paresis in the limbs, the early and marked involvement of the facial and deglutition muscles, the slight degree of the sensory loss and of pain, the absence of mental symptoms, and finally by the relatively early date at which recovery sets in and its favourable progress.

In neuritis due to lead the palsy almost always picks out at first certain groups of muscles, such as the extensors of the wrists, and if it becomes general it is usually associated with that group of cerebral symptoms which have been described as lead encephalopathy. Arsenical neuritis is easily recognizable by the prominence of gastrointestinal symptoms, pigmentation and trophic disturbances, serious sensory loss, early muscular atrophy, and its very slow convalescence; while beri-beri may be excluded by the absence of oedema, and vasomotor and cardiac symptoms.

TREATMENT.

The treatment in the present state of our knowledge can be only symptomatic. The patients should be kept warm and comfortable, the danger of respiratory complications should be guarded against, and care should be taken even from the beginning of the illness that the paralysed muscles are not unduly stretched. Certain of the cases seemed to benefit from diaphoresis and the employment of diuretics.

The Chadwick Lecture

ON

MENTAL HYGIENE AND SHELL SHOCK DURING AND AFTER THE WAR.

BY

F. W. MOTT, M.D., LL.D., F.R.S.,

MAJOR R.A.M.C.(T.F.).

MR. PRESIDENT, LADIES AND GENTLEMEN,—A new epoch in military and medical science, has arisen in consequence of the employment of high explosives, combined with prolonged trench warfare, in this terrible war.

The term "shell shock" is applied to a group of varying signs and symptoms, indicative of loss of functions and disorder of functions of the central nervous system, arising from sudden or prolonged exposure to forces generated by high explosives. In a large number of cases, although exhibiting no visible injury, shell shock is accompanied by burial. Again, cerebral or spinal concussion may be caused by sand-bags, hurled from the parapet or parados of the trench, striking the individual on the head or spine. The soldier may be concussed by the roof or wall of the dug-out being blown in, or he may be driven violently against the wall of the trench or dug-out, or blown a long distance simply by the strength of the explosion.

It has been shown that the force generated by 17-inch shells is equal to 10,000 kilograms per square metre, or 10 tons to the square yard. This supports the contention that even death may occur as the result of aerial concussion, generated by high explosives, without visible injury. I think probably the cause of death in such a case would be sudden arrest of the vital centres. The stem of the brain, surrounded by the cerebro-spinal fluid, is prevented

from oscillating by the anterior and posterior roots and the ligamentum dentatum. The cerebro-spinal fluid therefore acts as a water jacket to the spinal cord and water cushion to the base of the brain. A sudden shock of great intensity would be transmitted through this incompressible fluid, and seeing that it not only surrounds the central nervous system, but fills up the hollow spaces, ventricles, and central canal, and all the interstices of the nervous tissues, it follows that a shock of sufficient intensity communicated to the fluid would occasion commotion of the delicate colloidal structures of the living tissues of the brain and spinal cord. Such commotion would certainly lead to disordered function, and, if severe, to loss of function. The higher centres are the most likely to be affected; therefore consciousness, memory, sensory perception, and speech suffer. If the commotion is sufficient to arrest the functions of the vital centres in the medulla instant death would ensue, but it is difficult to determine in many cases whether the force was delivered by the hurling of a sand-bag against the head or spine or simply by aerial concussion in a confined space.

This leads me to call your attention to another important factor which may complicate the condition termed "shell shock." The soldier, while lying partially buried and unconscious, or at any rate helpless, may be exposed to various noxious gases, generated by shells or mines, especially carbon monoxide, or oxides of nitrogen, both of which are poisonous by reason of the deoxygenating effects upon the blood. Other poisonous gases from shells may produce most injurious and even fatal results; for example, cyanogen compounds, phosgene, which is chloride of carbonyl, etc. Both these gases are very deadly in their effects.

Malingering as shell shock is, I am informed by Captain William Brown, quite common at the front, and the detection of conscious fraud is not easy in many of these cases, owing to the fact that a functional neurosis due to a fixed idea or obsession, inhibiting will power, may be mistaken for malingering. Again, the notion of never recovering tends to become a fixed idea, and this fact is of considerable importance in respect to discharge from the army "permanently unfit," and the subsequent payment of pension and compensation. It is essential to be sure of your diagnosis that the disease is altogether functional, and being satisfied thereof, to avoid all forms of suggestion of non-recovery.

Mental and Bodily Condition at the Time of Receiving the Shock.

In considering the effects of shell shock on the nervous system, it is necessary to call attention to a complex of factors of extrinsic and intrinsic origin, apart altogether from the effects produced by direct material injury to the central nervous system by commotion and concussion. I will now consider the extrinsic conditions in modern trench warfare which lead in a neuro-potentially sound individual to nervous exhaustion, predisposing to shell shock. It must be obvious that through all the sensory avenues exciting and terrifying impressions are continually streaming to the perceptual centres in the brain, arousing the primitive emotions and passions, and their instinctive reactions. The whole nervous system, excited and dominated by feelings of anger, disgust, and especially fear, is in a condition of continuous tension; sleep, the sweet unconscious quiet of the mind, is impossible or unrefreshing, because broken or disturbed by terrifying dreams.

Living in trenches or dug-outs, exposed to wet, cold, and often (owing to shelling of the communication trenches) to hunger and thirst, dazed or almost stunned by the unceasing din of the guns, disgusted by foul stench, by the rats and by insect tortures of flies, fleas, bugs, and lice, the minor horrors of war, when combined with frequent grim and gruesome spectacles of comrades suddenly struck down, mangled, wounded, or dead, the memories of which are constantly recurring and exciting a dread of impending death or of being blown up by a mine and buried alive, together constitute experiences so depressing to the vital resistance of the nervous system, that a time must come when even the strongest man will succumb, and a shell bursting near may produce a sudden loss of consciousness, not by concussion or commotion, but by acting as the "last straw" on an utterly exhausted nervous system,

worn out by this stress of trench warfare and want of sleep.

In considering the effects of shell shock it is necessary to take into account the state of the nervous system of the individual at the time of the shock caused by the explosion. As I have indicated, a neuro-potentially sound soldier may, from the stress of prolonged trench warfare, acquire a neurasthenic condition, and it stands to reason that a soldier who is already neurasthenic from a previous head injury, or from acquirement of a disease prior to his being sent to the front, will not stand the strain so well as a neuro-potentially sound man.

Of even greater importance than the extrinsic conditions in the causation of military unfitness from exposure to shell fire are the intrinsic conditions, for if there is an inborn timorous or neurotic disposition, or an inborn or acquired neuropathic or psychopathic taint, causing a *locus minoris resistentiae* in the central nervous system, it necessarily follows that such a one will be unable to stand the terrifying effects of shell fire and the stress of trench warfare. A large number of the cases of shock which I see in hospital, and which especially require treatment by mental hygiene, are neuro-potentially unfit.

They come back after a short experience at the front, suffering with neurasthenia or hysteria, which persists for months and even a year or more; these are temperamentally unfit.

To take two concrete examples of the importance of the personal factor in the consideration of the causation of shell shock. A commercial traveller, with one year's training, three weeks in France, and three days in the trenches, was sent home suffering with shell shock; after six months in hospital, he is still tremulous and hardly able to stand or walk. He has done his best, but has cost as much as a cartload of shells. Compare the personality of this man with another, who was also admitted under my care suffering with spinal concussion, paralysed in all four extremities, with loss of control over his bladder and bowels. The history he gave was that he was in a dug-out, when an 8-in. shell burst 2 ft. behind the dug-out; he was partially buried, but did not lose consciousness; when he was rescued, he was found to be paralysed. Now this man shows none of the signs of shell shock. He has no terrifying dreams, and, although the concussion caused a haemorrhage into his spinal cord, followed by degeneration of the pyramidal tracts—namely, the paths of volitional impulses—nevertheless he is making a splendid recovery, and in two months is much less helpless than most of the severe functional cases of paraplegia, in which the paralysis of the legs is due to a fixed idea that they are unable to walk or stand. He appeared to be insusceptible to emotional shock.

As we know, one of the peculiarities of the functional neuroses—for example, hysteria—is not only the sudden manner in which an emotional shock may cause a loss of function, but likewise the sudden manner in which it may be unexpectedly restored by a stimulus of the most varied kind, provided there is an element of surprise—that is, his attention is for the moment taken off its guard. I am referring especially to hysterical mutism and aphonia. If the patient was neuro-potentially sound, he will recover as a rule from shell shock by rest of the mind and body under healthy conditions, without any special treatment. But the neurotic, the neuropathic, and the psychopathic individual, with an inborn or acquired *locus minoris resistentiae* in the central nervous system, is more difficult to treat successfully, for when an inborn or acquired predisposition to a neurosis or psychosis exists, functional disorders or disabilities of the nervous system tend to become organized by habit, and eventually firmly installed.

Before we consider the mental hygiene of shell shock it is necessary to point out the more important signs and symptoms, for although the general principles of treatment are the same, special functional disorders and disabilities necessitate special methods.

Effect of Shell Shock on Consciousness.

Most of the severe cases have suffered with loss of consciousness, or they have no recollection of what happened after the shell burst, and till they were at the clearing station or hospital; it does not follow that they were in a state of complete unconsciousness during that time, for

cases have been recorded where, under hypnotic suggestion, they have been able to revive in consciousness some of the forgotten events. Often instead of complete unconsciousness loss of power of recollection seems to be the effect produced on consciousness by the shock.

Many cases have been admitted under my care at the Neurological Section of the 4th London, who had not yet recovered normal consciousness, and for some days were in a dazed, somnolent, or even semi-conscious condition. Usually these cases came at a time when large convoys were sent from the front owing to a recent engagement. The histories of cases sometimes showed that men absented themselves following shell shock, and, wandering away from the trenches, were found in a dazed condition, unable to account for their actions or to recollect how they came there. This condition is not unlike a fugue or automatic wandering of an epileptic; and indeed, in some of these cases there was a history of epilepsy or a predisposition to it, but in others no other cause was ascertainable than the conditions which induced shell shock.

A good many patients say that they can picture in their mind's eye the shell coming; they visualize the death and destruction caused, and they can revive in memory the sound of the explosion, but a blank of variable duration in their recollection of events follows. Many of these patients have not really suffered with either cerebral commotion or concussion, and in strict acceptance of the term are not true shell shock cases. Cases of severe concussion or commotion have not only an anterograde but also a retrograde amnesia, and these cases may sometimes show such a complete loss of memory of any event in their past life that they do not know their own name or where they live; in fact, their recollection is a blank, as if the commotion had obliterated the storehouse of the mind and its contents. In these cases it is quite probable there has been either an additional factor of concussion or burial with gassing.

The drowsy stupor which many of these patients suffer from may disappear gradually, or it may be associated with auditory or visual hallucinations of a terrifying nature, day dreams of the terrible experiences they have gone through. As the mind becomes more conscious of the external world, these day dreams are screened off, and, as a rule, are not able to pass the threshold of consciousness; but I have had cases where terrifying visual hallucinations have quite suddenly and unexpectedly induced all the external manifestations of fear—for example, profuse sweating, a wild terrified look and attempt to escape by flight, and when prevented from doing so, fear gave place to maniacal excitement and desperate struggling to escape. Some of the cases are obsessed with a terrifying experience. Now although, as a rule, in most cases these experiences do not come up into consciousness during the daytime when the mind is occupied in reacting to the constant perceptual chain of events, yet, if the mind is not diverted from introspection, they are always ready to obtrude themselves on consciousness, and this is clearly shown by the fact that one of the most constant, most serious and disturbing symptoms of shell shock is the terrifying dreams which are seldom, if ever, absent.

The Effects of Contemplative Fear.

Fear, in its depressing effects upon the mind and body, plays a very important part in the production of a hysteric or neurasthenic condition. Terror is contemplative fear; it is fear made more or less permanent by the imagination fixing in the memory past terrifying experiences, repressed in great measure by conscious activity of the mind during the waking state, but evident in dreams.

In addition to the revival of experiences of trench warfare—of hearing the shells burst and seeing the flash, of parapets being blown down, of being buried, of charging the enemy—soldiers often complain of a falling or sinking feeling.

I have had four or five cases of soldiers who in their sleep have gone through the pantomime of fighting with the bomb, with the bayonet, and with rifle. In consequence of the danger of injuring themselves in their unconscious but violent purposive motor activities, it sometimes became necessary to place them on a mattress in a padded room.

When these dreams cease, the patient is getting better,

They are indicative of terror, and the signs and symptoms these patients suffer from are largely due to the continued effect of fear on consciousness. It is obvious that this fact is all-important to bear in mind when considering the mental hygiene of shell shock. When we come to consider the principal objective signs and subjective symptoms of shell shock, we shall see that they very largely correspond with those of paralytic fear. We speak of being paralysed by fear—of giving way of the knees, of trembling or quaking with fear, of being dumb with fear.

All these popular expressions regarding the influence of the emotion of fear on the human body are based upon actual experience, for paralysis, tremors, giving way of the legs, mutism, and cold, blue hands are among the most constant signs of soldiers suffering with "shell shock."

Influence of Fear on Phonation and Speech.

A frequent condition met with is aphonia and mutism, or inability to speak even in a whisper. This in no way differs from hysterical aphonia and mutism.

It is the conscious mind operating on the centres in the brain controlling phonation which causes this affection of speech, for mutes often shout in their sleep, and this may be the prelude to the recovery of their speech; one man recovered his speech on being told that he had been talking in his sleep by a comrade who slept in the next bed; he was so surprised that he said, "I don't believe it." Another man recovered his speech when pitched out of a punt on New Year's Eve; he had been mute for more than six months. This lad could not whistle, could not phonate in coughing, could not blow out a candle, yet he was heard to shout in his sleep. An x-ray examination of his chest showed that the diaphragm hardly moved even when he made a great effort; the fear effect on his conscious mind had inhibited the respiratory movements necessary for phonation, and the idea had become firmly installed in his mind. Breathing exercises to relax the contracted respiratory muscles may be usefully employed in some of these cases.

Suggestion and Hypnotism in Mutism.

Mutism is often accompanied by deafness; sometimes the patient recovers his speech and remains deaf. I have had a great number of cases of mutism and mutism with deafness, and in only one instance have I been unable by suggestion or other means to restore the function. A particularly intractable case came to the hospital, who had been deaf and dumb for nearly a year; I tried strong electric shocks, tuning-forks to the head, and sudden noises and hypnotism, without any result, but Dr. Yelland of the National Hospital, Queen Square, cured this man. I think the imposing array of electrical machines, coloured lights, and other strong suggestive influences, were partly instrumental in accomplishing what I had failed to do, but also I think the knowledge of success in other difficult cases attending Dr. Yelland's efforts played a very important part in curing by strong suggestion this apparently hopeless case.

When I have thought a patient was consciously prolonging his disability I have said to the sister aside, but loud enough for the patient to hear, "This man must be kept in bed on No. 1 diet, and when he can ask loud enough for you to hear he can have a bottle of stout and a mutton chop." I have had several get well the next day by this treatment.

Hysterical Sensory Dissociation.

The deafness may be partly functional, partly due to injury of the drum of the ear, or wax may be damped against the drum. Only about 17 per cent. of the cases of deafness are really due to, or partly due to, ear disease; the majority of the cases are purely functional, and due to dissociation of the sensory perceptive centres of hearing of the brain. They do not hear the tuning-fork, although they feel the vibration. There may be dizziness, but there are signs which clearly serve to differentiate this functional cortical brain deafness from the deafness due to damage of the organ of hearing and equilibrium, or the nervous structures in it.

Sometimes a man is blind, and an examination of the eyes shows that there is no injury or cause in them to account for the loss of sight. Vision may be lost suddenly, and restored suddenly; suggestion plays an all-important part not only in dissociating the visual perceptive structures in the brain from the nervous tracts which convey the light stimuli from the eyes, but in restoring the sight by reassociating them. Here I may say how important it is to ascertain how long a man has been in the front line in estimating how much of the functional disorder or disability is due to a pre-war neurotic condition.

Diagnosis of Functional Disease.

Often a slight injury or contusion to a limb will cause a functional paralysis of that limb, or of the arm and leg on that side; or a blow on the back will cause by suggestion a paralysis of both the lower limbs, so that the patient can neither stand nor walk.

There are certain signs known to the expert which enable one to determine whether the disease is functional or organic. These I will not discuss.

From what I have said you will understand that a great number of cases that are called shell shock are really hysteria or neurasthenia occurring in individuals predisposed to neurosis, and unable therefore to undergo the strain of modern trench warfare for any lengthened period of time. A number of conditions might induce the symptoms or signs of hysteria or neurasthenia in such individuals, particularly an emotional shock or intense fear. These cases of neurosis are really more difficult to deal with than those of neuro-potentially sound individuals who have suffered with the real shell shock, and where there has been either concussion with loss of consciousness, or cerebral commotion with loss of consciousness, or inhalation of poisonous gas.

Treatment of Shell Shock in the Early Stage.

I am informed by medical officers at the clearing stations that there is an increase of pressure of the cerebro-spinal fluid in shell shock cases, and that sometimes even it is blood stained or contains albumin; also, that relief of symptoms occurs by withdrawing fluid by lumbar puncture.

The treatment of cases of shell shock varies to some extent in different individuals, according to symptoms and signs, but there are some symptoms which are seldom absent in all true cases—namely, insomnia and terrifying dreams. I have found the continuous warm bath of great value in the treatment of these cases when they come over from France. The water in the bath is kept continuously at the temperature of the blood by a special mechanism of heat regulation; the patients are kept in the bath for a quarter to three-quarters of an hour, or even longer. The effect is most soothing on the nervous symptoms. These baths are extremely useful in cases of maniacal excitement. Often the bath, with a drink of warm milk at bedtime, suffices without hypnotics to produce sleep. But if hypnotics have to be given, the quantity required is less when combined with the baths. The next thing is to attend to the general bodily condition by nourishing, digestible, and easily assimilated food; and, lastly, very important is attention to the primae viae, by which autointoxication and cerebral congestion can be relieved. The severe headache from which these patients suffer requires relief by an icebag to the head, aspirin, phenacetin, and drugs which relieve neuralgic pains. After the patient has recovered from the more serious condition of shock and the mind is becoming more alert and interested in its surroundings, we have to consider how best to allay the symptoms which nearly all suffer from—namely, headaches, dizziness, tremors, feeble circulation, and exhaustion, readily brought on by mental or bodily effort. If the patient is sufficiently well to sit up, it is better that he should do so, at first for a few hours a day, if possible in the open air. To severe cases, the noise of gramophones, pianos, the click of billiard balls, and even musical instruments, excite and aggravate symptoms; quiet repose in single rooms, such as we have at the Maudsley Hospital, is undoubtedly a most important and necessary mode of treatment in the early stages of severe cases.

At the same time these patients should not be left alone; quiet and unstimulating diversion of the mind should be encouraged, to avoid introspection and dwelling

upon the terrible experiences they have gone through. These men are often too tired or unable to read, for want of concentration of attention, and may be amused by simple games, knitting or wool work, bead work, basket work, and net making.

Mental Hygiene in Later Stages.

As soon as they are better, patients are encouraged to play billiards, cards, and other games, in the winter time especially; also there are frequent concerts and popular lectures, all of which serve to divert the mind and produce an atmosphere of cure, which is very essential. Soldiers will put up with a good deal provided they have good and abundant food, and it is essential for recovery that there should be no grumbling. Grumbling and grouching are contagious, and it is always well to get rid of a soldier from a ward if he is exciting discontent in the others. Discipline is very essential; laxity of discipline, over-sympathy and attention by kind well-meaning ladies giving social tea-parties, drives, joy-rides, with the frequent exclamation of "poor dear," has done much to perpetuate functional neuroses in our soldiers. The too liberal gifts of cigarettes have produced a cigarette habit in officers and men which is highly detrimental in these cases of war neurosis, especially in cases of irritable dilated heart.

Again, in many functional paralyses, the idea of a permanent disability requiring pension for the rest of a man's life, may become a fixed idea, owing to wrong diagnosis, over-sympathy, and misdirected treatment. In many of these cases, as I have found, what is required is merely strong suggestion to the patient that there is nothing the matter with him except the idea that he is paralysed, which has become installed and firmly fixed in his mind by prolonged bed, daily massage and electricity, which has kept suggesting to him that there is an organic disease causing his complaint.

Some patients, owing to an injury by a fall caused by an exploding shell, have developed a functional paralysis on the side of the injury, either arm or leg, or one of these limbs. Supposing it is the arm that is so affected, I perform a number of associated movements of the two arms together—the healthy one and the paralysed—myself assisting the immobile arm, telling the patient at the same time to help me by thinking of the same movement. After a little while he may be doing the main part of the movement himself. In all these functional paralytic conditions of an hysterical nature a great tonic is to tell the patient that it is not at all likely that he will ever be sent back to active service, for he would be no use, and that what we want to do is to discharge him from the service in such a state that he will be fit to resume his previous occupation, or we can put him to some work useful to the State, whereby he will not be a burden to himself or the community. I am quite sure that if this method were adopted early, in a large number of cases known by an expert to be temperamentally unfit for military service, a great economic saving would be effected. Of course precautions would have to be taken against malingerers. I am sure that machines employed by doctors as a means of making the functional paralytics move their limbs are wrong in principle and in practice, and I entirely approve of the methods adopted by Colonel Deane at the Croydon Hospital of restoring function by natural methods, in which the mind is exercised.

Colonel Deane lays especial stress upon the value of associated movements, such as we get with the parallel bars, the climbing rope, skipping, football, Indian clubs, and the nautical wheel, and the ordinary apparatus of the old-fashioned gymnasium. My contention is that this apparatus can be applied to any man who is capable of any movement. The inestimable advantage is that his mind is projected into his paralysed limb, and all his sound limbs are being exercised at the same time. Constant change and adaptation is another advantage, especially when associated with mental occupation in the work. Diversion of the mind by useful occupation, both in the workshop and in the garden, have been most successful in restoring health and strength to these disabled men. This treatment I have been enabled to carry out through the generosity and kindly interest of Lady Henry Bentinck, who at her own expense has built in the grounds at the Maudsley Hospital a large workshop fitted with every appliance for carpentering, cabinet making, and

metal work, and with a first-rate instructor. There are patients, however, who cannot stand the noise of the hammering and tapping.

Agricultural Employment During and After the War.

I am convinced that occupation in the open air is a very beneficial mode of treatment of nervous cases in the convalescent stage. It does not, however, always seem to be popular with a certain type of case. In commencing the treatment of convalescents by manual labour, it is essential to regulate carefully the character of the labour and the number of hours per day, and the work should be so arranged and graduated as not to induce more than that gentle sense of fatigue that promotes appetite, interest, sleep, and the general sense of well-being. Each case, therefore, has to be inquired into and the individual encouraged to take interest. When a shell-shock case is discharged from the service who by upbringing or inclination has a desire to work on the land, means should be provided whereby he can do so. The money he earns for his labour should be supplemental to the pension money or gratuity.

TREATMENT OF CRANIAL INJURIES IN WAR.*

BY

CAPTAIN J. ANDERSON, R.A.M.C.

THE main object of this short paper is to urge the plea for early and complete operative interference in gunshot wounds of the skull.

By *early*, I mean the earliest possible moment after injury that the patient can be brought to an area where environment and staff are suitable for cranial surgery. Exigencies of military situation or type of campaign may affect this, but, as a rule, these areas are to be found in the casualty clearing station of to-day.

By *complete*, I mean operation on the lines suggested by Colonel Gray in his paper.¹ As I have no doubt you are all familiar with this, I will only touch later on certain points that have particularly appealed to me. I consider, however, that it is almost essential to actually see the method practised by one who is thoroughly familiar with the routine, in order to appreciate the finer points of technique.

Here I wish to emphasize that the operation must always be considered as one where a most careful and exact surgical toilet is to be observed if results are to be attended with success.

The findings of our French colleagues, as reported in the *Presse médicale*, February, 1915, was: "All wounds of the skull should be trephined at once, and that this is the operation of urgency *par excellence* in military surgery." Since then early interference appears to have increased in favour.

In earlier days I adopted the more conservative procedure of excision of scalp wound in minor cases, and evacuation to base for further interference if necessary. This is not good, because on arrival at base, if trephining had to be done, my excised wound had to be again excised to get rid of a possibly septic area. For the more severe cases I performed a complete operation, but left the wound open.

Those cases which I was able to trace compare unfavourably with our more recent results. I think, therefore, that the axiom "All or nothing" is a sound one to adopt in the majority of cases.

Since August, 1916, I have adopted the method as demonstrated to me by Colonel Gray. I had previously attempted this, but I found that I obtained more uniformly good results on observing one or two finer points wherein my technique failed. No other class of wound has given the same even and gratifying results.

I think *all* scalp wounds, perhaps with the exception of minute abrasions, ought to be excised. Suspicion of bone injury demands investigation. It is very frequently found, particularly in the frontal region, that what appears to be a simple symptomless scalp wound is one involving much brain tissue.

During an action many factors govern the question at issue. I feel certain, however, that no case of head injury

* Paper read at a meeting of medical officers of an army in the field.